Commodity Machine Learning and beyond

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@amuellerml
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We Want You!
To Apply Machine Learning!

What ML can do for you

Classification

Hi Andy,

I just received an email from the first tutorial speaker, presenting right before you, saying he's ill and won't be able to make it.

I know you have already committed yourself to two presentations, but is there anyway you could increase your tutorial time slot, maybe just offer time to try out what you've taught? Otherwise I have to do some kind of modern dance interpretation of Python in data :-)
-Leah

Hi Andreas,

I am very interested in your Machine Learning background. I work for X Recruiting who have been engaged by Z, a worldwide leading supplier of Y. We are expanding the core engineering team and we are looking for really passionate engineers who want to create their own story and help millions of people.

Can we find a time for a call to chat for a few minutes about this?

Thanks

Classification

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I know you have a… …ourself to two presentations… …y you could increase you… …, maybe just offer time to try out what you've taught? Otherwise I have to do some kind of modern dance interpretation of Python in data :-)
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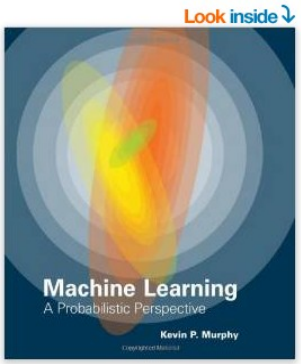
Can we find a ti… …for a few minutes about t…

Thanks

Classification

Recommendations



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Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series) Hardcover

by Kevin P. Murphy (Author)

★★★★☆ 31 customer reviews

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Today's Web-enabled deluge of electronic data calls for automated methods of data analysis. Machine learning provides these, developing methods that can automatically detect patterns in data and then use the uncovered patterns to predict future data. This textbook offers a comprehensive and self-contained introduction to the field of machine learning, based on a unified, probabilistic approach. The coverage combines breadth and depth, offering necessary background material on such topics as probability, optimization, and linear algebra as well as discussion of recent developments in the field, including conditional random fields, L1 regularization, and deep learning. The book is written in an informal, accessible style, complete with pseudo-code for the most important algorithms. All topics are copiously illustrated with color images and worked examples drawn from such application domains as

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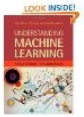
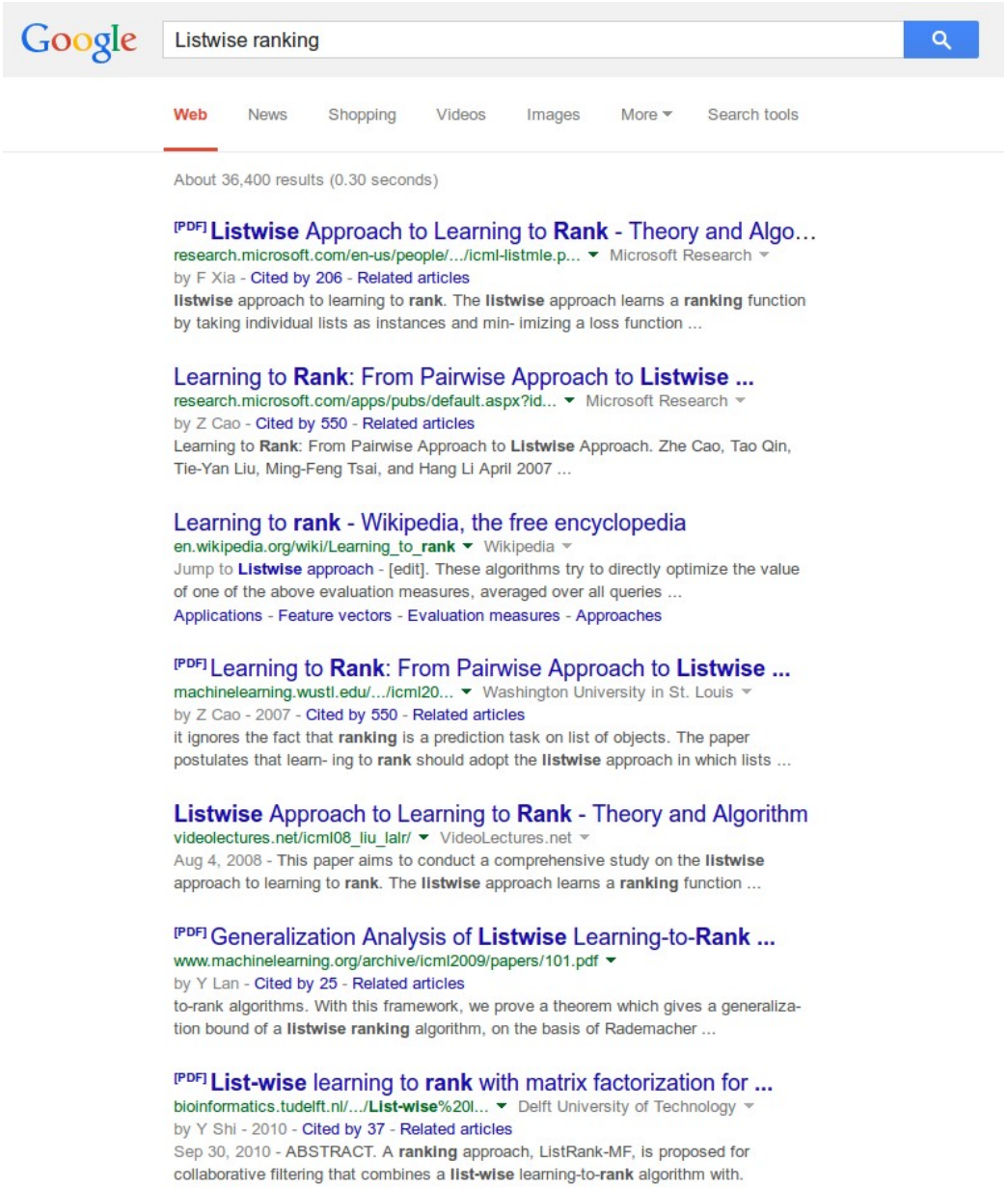


Understanding Machine Learning: From Theory to

An Introduction to Statistical Learning: …

Ranking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it ignores the fact that ranking is a prediction task on list of objects. The paper postulates that learn- ing to rank should adopt the listwise approach in which lists ...
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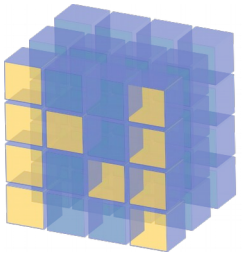
Applying machine learning is easy.

Applying machine learning is easy.
But it should be easier!

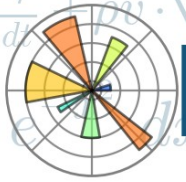
python

IP[y]: IPython
Interactive Computing

SciPy



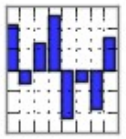
NumPy

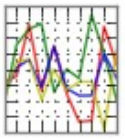


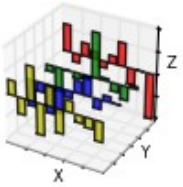
matplotlib

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$







IP[y]: IPython
Interactive Computing

Chapter 4 - Working With Text Data. - Mozilla Firefox

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IPy Chapter 4 - Workin...

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DuckDuckGo

IP[y]: Notebook Chapter 4 - Working With Text Data. (autosaved)

File Edit View Insert Cell Kernel Help

Code Cell Toolbar: None

In [22]:
```
from sklearn.svm import LinearSVC
svm = LinearSVC(C=.01)
```

In [23]:
```
svm.fit(X_train, y_train)
```

Out[23]:
```
LinearSVC(C=0.01, class_weight=None, dual=True, fit_intercept=True,
     intercept_scaling=1, loss='l2', multi_class='ovr', penalty='l2',
     random_state=None, tol=0.0001, verbose=0)
```

In [24]:
```
svm.score(X_train, y_train)
```

Out[24]:
```
0.88421586014694709
```

In [25]:
```
svm.score(X_test, y_test)
```

Out[25]:
```
0.83679637325273892
```

In [26]:
```
y_test_pred = svm.predict(X_test)
```

In [27]:
```
from sklearn.metrics import classification_report
```

In [28]:
```
print(classification_report(y_test, y_test_pred))
```

```
             precision    recall  f1-score   support

          0       0.84      0.96      0.90      1954
          1       0.82      0.48      0.61       693

avg / total       0.83      0.84      0.82      2647
```

In [29]:
```
coef = svm.coef_.ravel()
positive_coefficients = np.argsort(coef)[-25:]
negative_coefficients = np.argsort(coef)[:25]
interesting_coefficients = np.hstack([negative_coefficients, positive_coefficients])
```

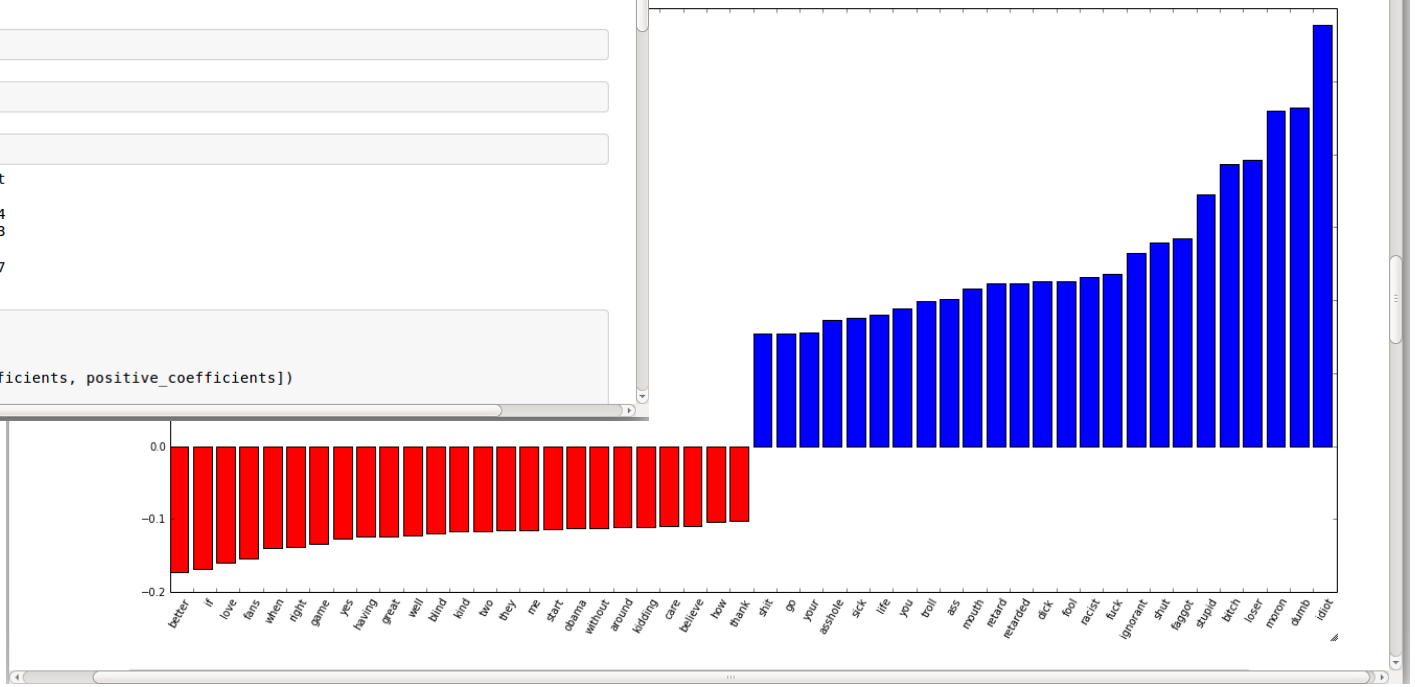
DuckDuckGo

xt Data. (autosaved)

ents, positive_coefficients])

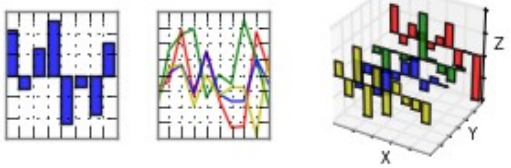
color=["red" if c < 0 else "blue" for c in coef[interesting_coefficients]])

coefficients], rotation=60, ha="right");



pandas

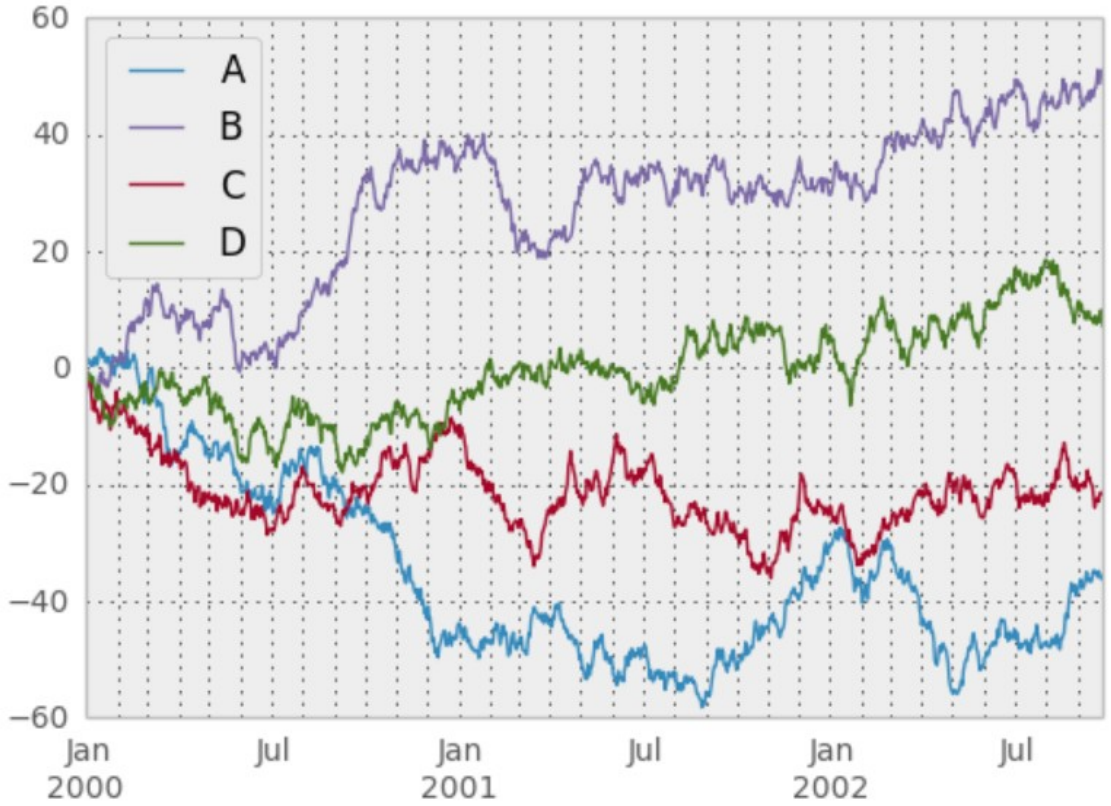
$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

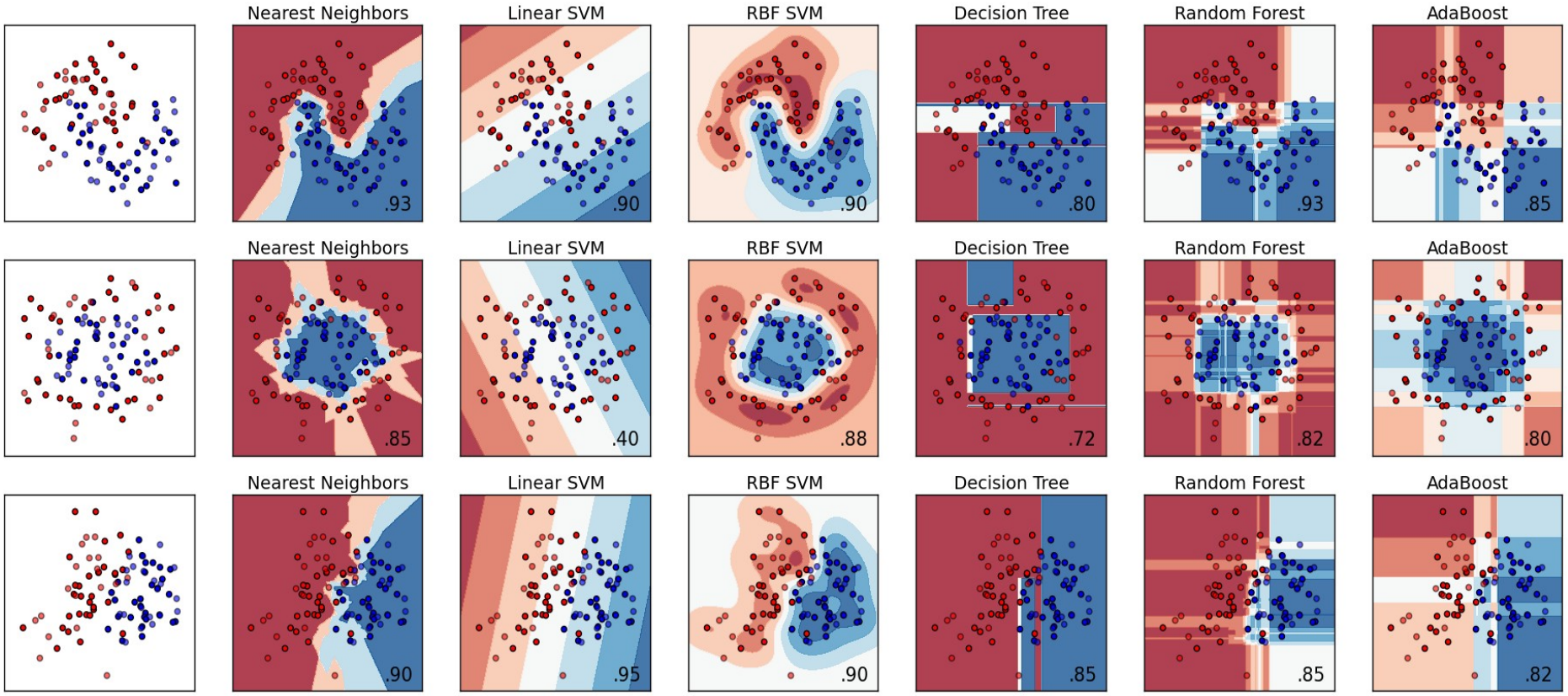



```
In [6]: df = DataFrame(randn(1000, 4), index=ts.index, columns=list('ABCD'))

In [7]: df = df.cumsum()

In [8]: plt.figure(); df.plot();
```




Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.93
.90
.90
.80
.93
.85
Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.85
.40
.88
.72
.82
.80
Nearest Neighbors
Linear SVM
RBF SVM
Decision Tree
Random Forest
AdaBoost
.90
.95
.90
.85
.85
.82

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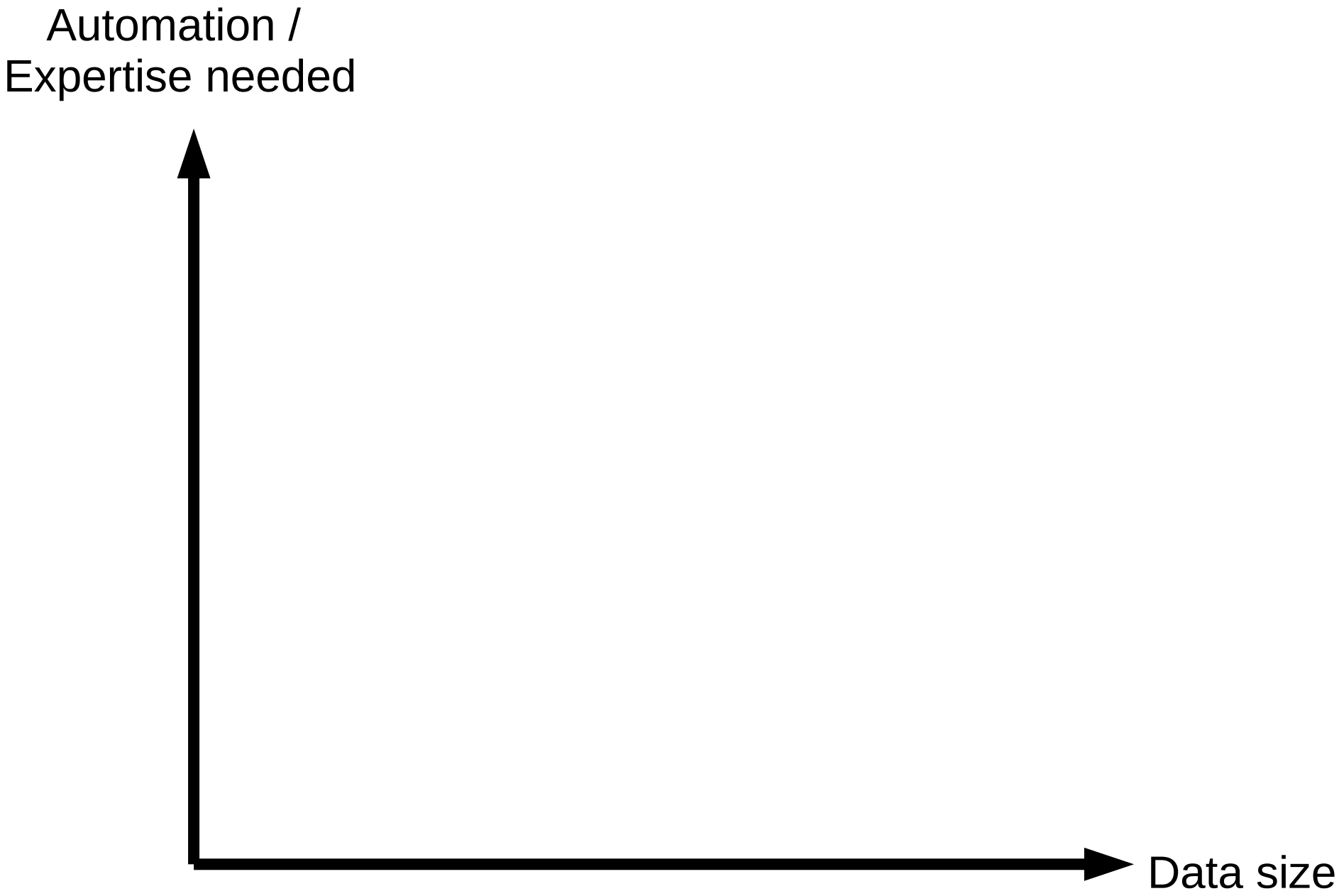
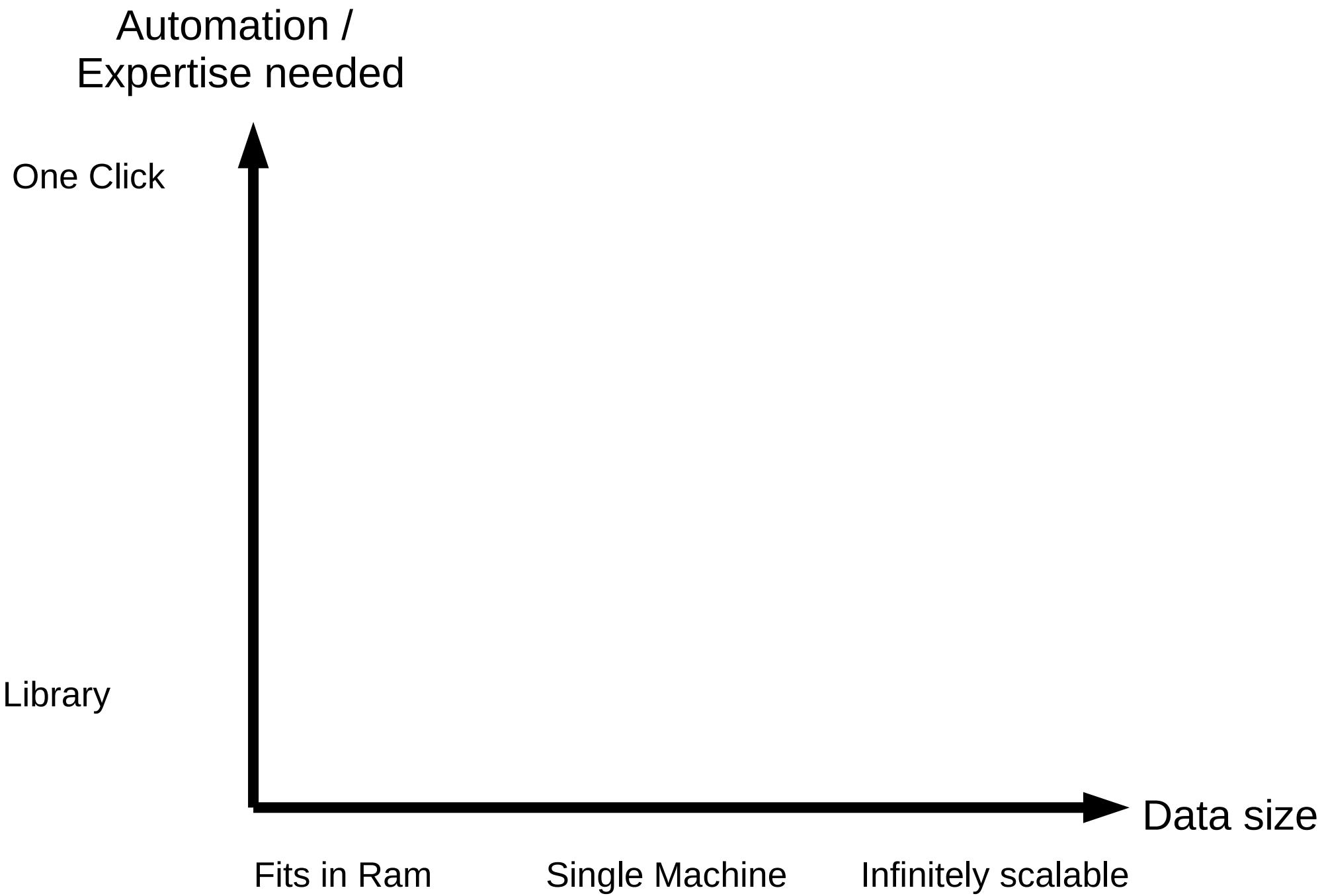
Fully Functional Spam Classifier

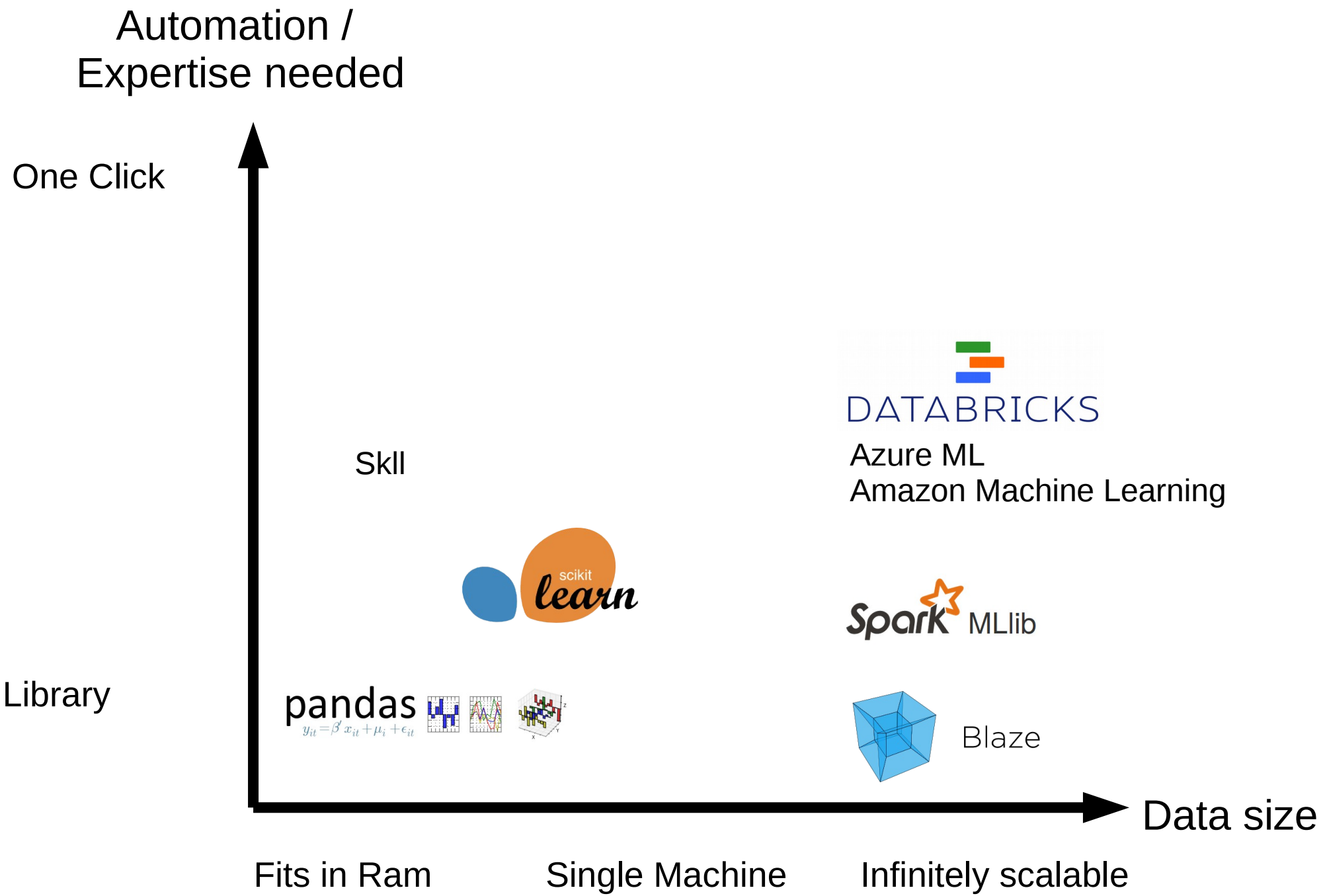
```
from sklearn.naive_bayes import MultinomialNB
from sklearn.feature_extraction.text import CountVectorizer
from pipeline import make_pipeline

spam_classifier = make_pipeline(CountVectorizer(),
                                MultinomialNB())
spam_classifier.fit(email_texts, is_spam)

spam_classifier.predict(new_emails)
```

“The scikit-learn tutorials / documentation is so good, one doesn't need a textbook anymore to learn a new machine learning method.”

This is not enough!


Automation /
Expertise needed
Data size


Automation /
Expertise needed
One Click
Library
Data size
Fits in Ram
Single Machine
Infinitely scalable


Automation /
Expertise needed
One Click
Library
SkIl
DATABRICKS
Azure ML
Amazon Machine Learning
scikit
learn
Spark MLlib
pandas
Blaze
Data size
Fits in Ram
Single Machine
Infinitely scalable

A single machine is (usually) enough.

	vCPU	ECU	Memory (GiB)	Instance Storage (GB)	Linux/UNIX Usage
r3.large	2	6.5	15	1 x 32 SSD	$0.166 per Hour
r3.xlarge	4	13	30.5	1 x 80 SSD	$0.333 per Hour
r3.2xlarge	8	26	61	1 x 160 SSD	$0.665 per Hour
r3.4xlarge	16	52	122	1 x 320 SSD	$1.33 per Hour
r3.8xlarge	32	104	244	2 x 320 SSD	$2.66 per Hour
Storage Optimized - Current Generation					
i2.xlarge	4	14	30.5	1 x 800 SSD	$0.853 per Hour
i2.2xlarge	8	27	61	2 x 800 SSD	$1.705 per Hour
i2.4xlarge	16	53	122	4 x 800 SSD	$3.41 per Hour
i2.8xlarge	32	104	244	8 x 800 SSD	$6.82 per Hour
d2.xlarge	4	14	30.5	3 x 2000 HDD	$0.69 per Hour
d2.2xlarge	8	28	61	6 x 2000 HDD	$1.38 per Hour
d2.4xlarge	16	56	122	12 x 2000 HDD	$2.76 per Hour
d2.8xlarge	36	116	244	24 x 2000 HDD	$5.52 per Hour

We need open box methods.

We need black-box methods.

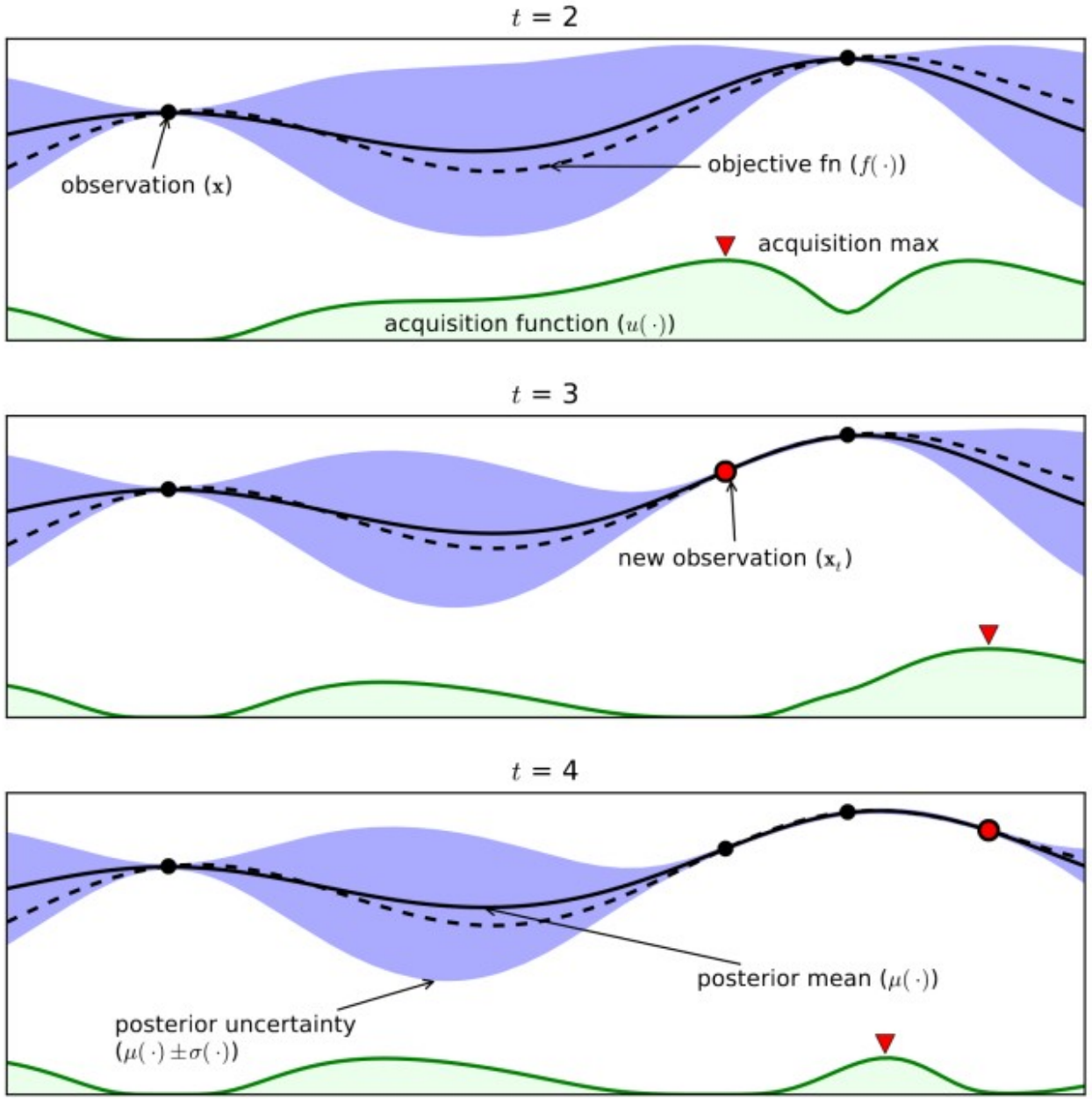
predict

Hyperparameter Optimization

Spearmint
Hyperopt
SMAC

… scikit-learn

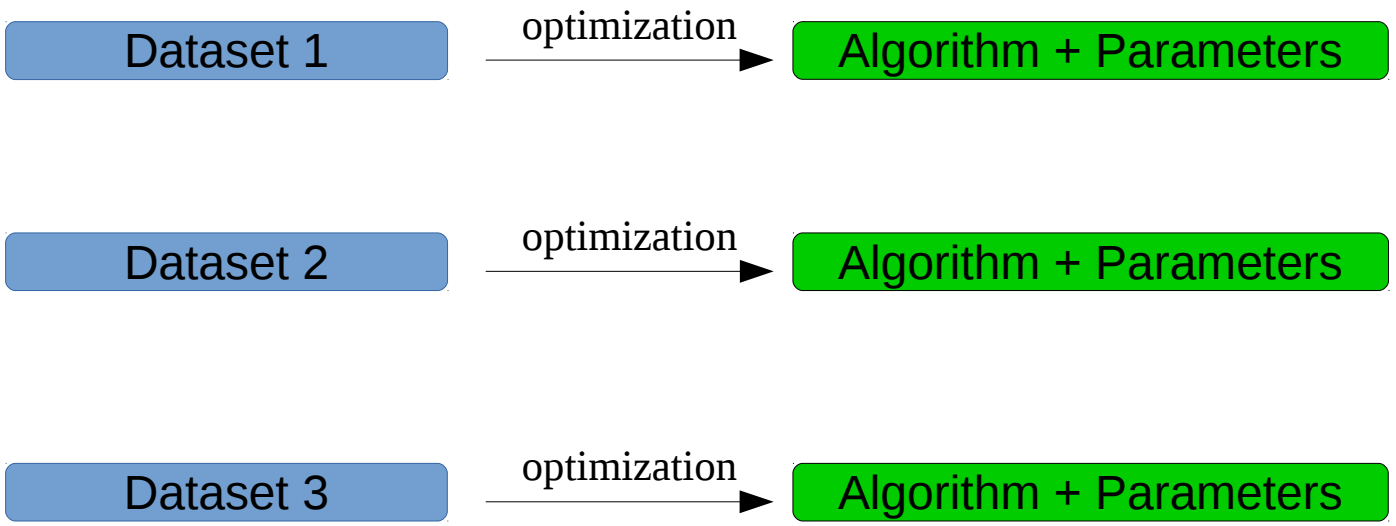
Bayesian Optimization



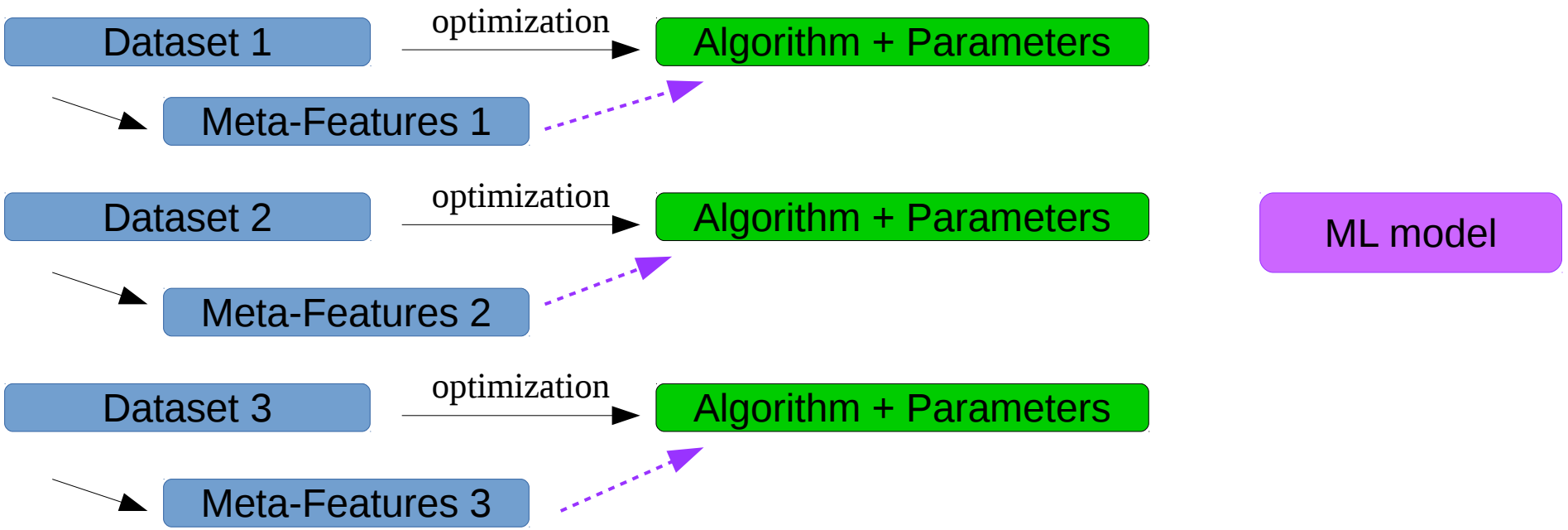
From Eric Brochu, Vlad M. Cora and Nando de Freitas

Meta-Learning

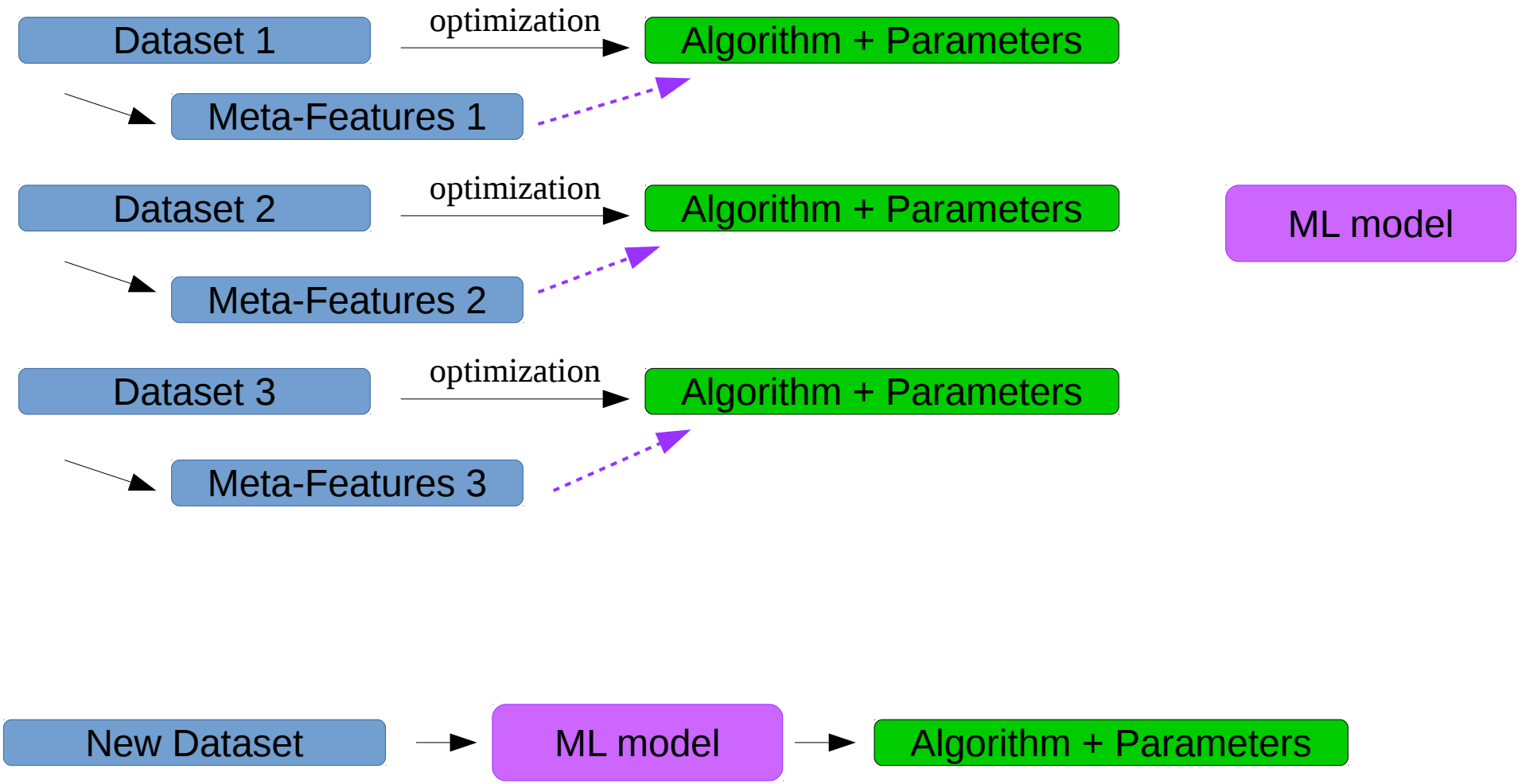
Meta-Learning

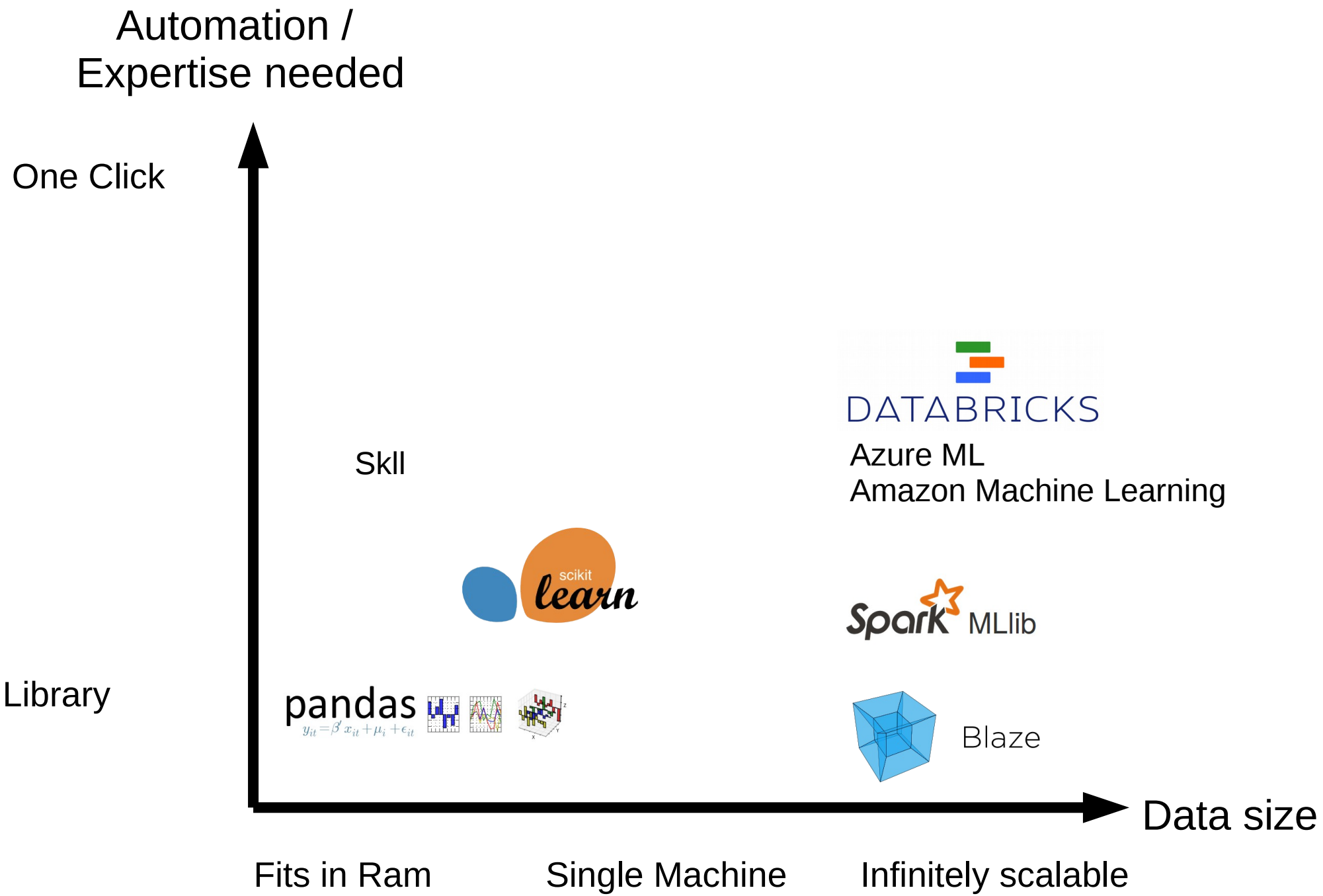


Meta-Learning



Meta-Learning

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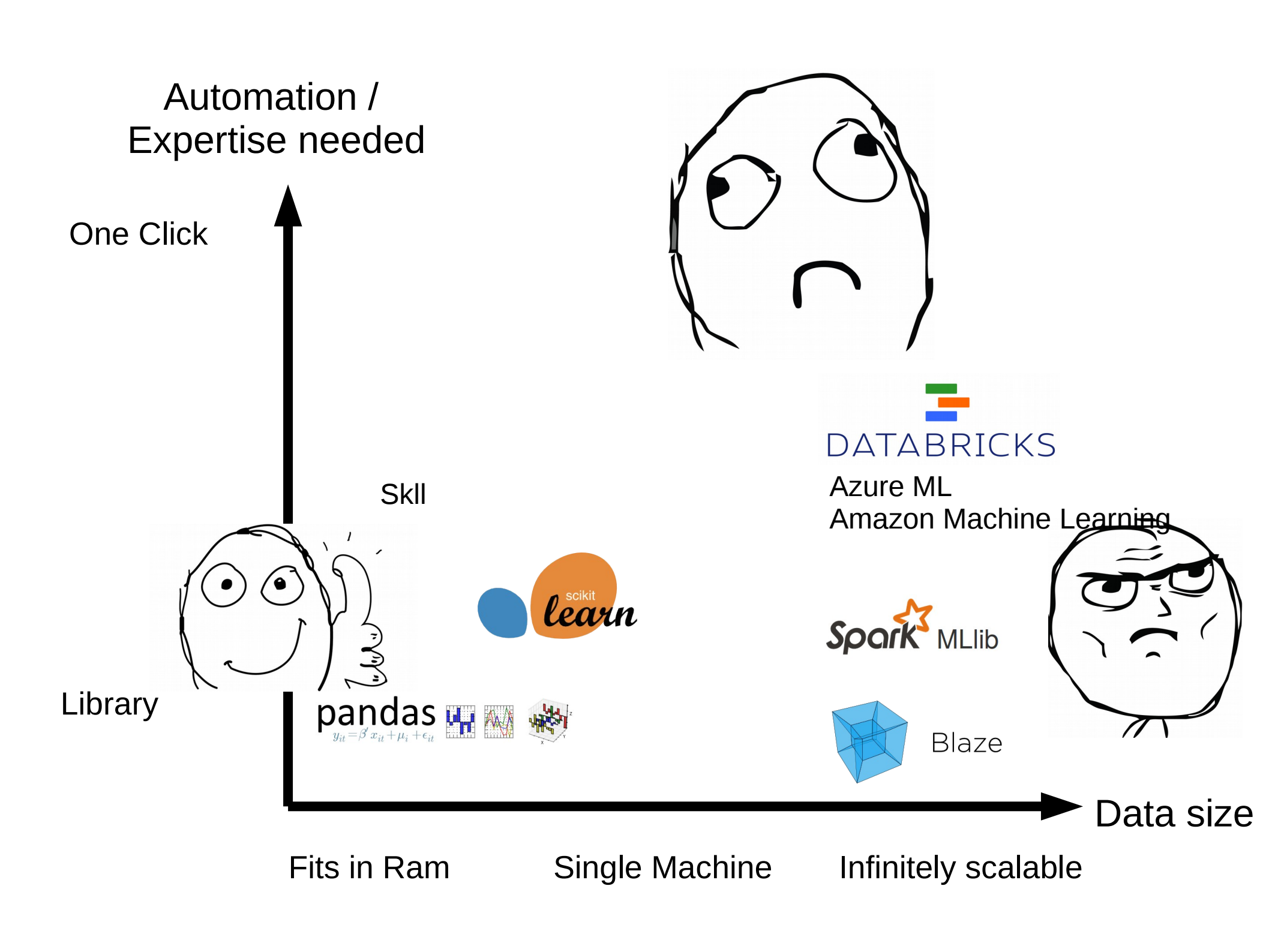
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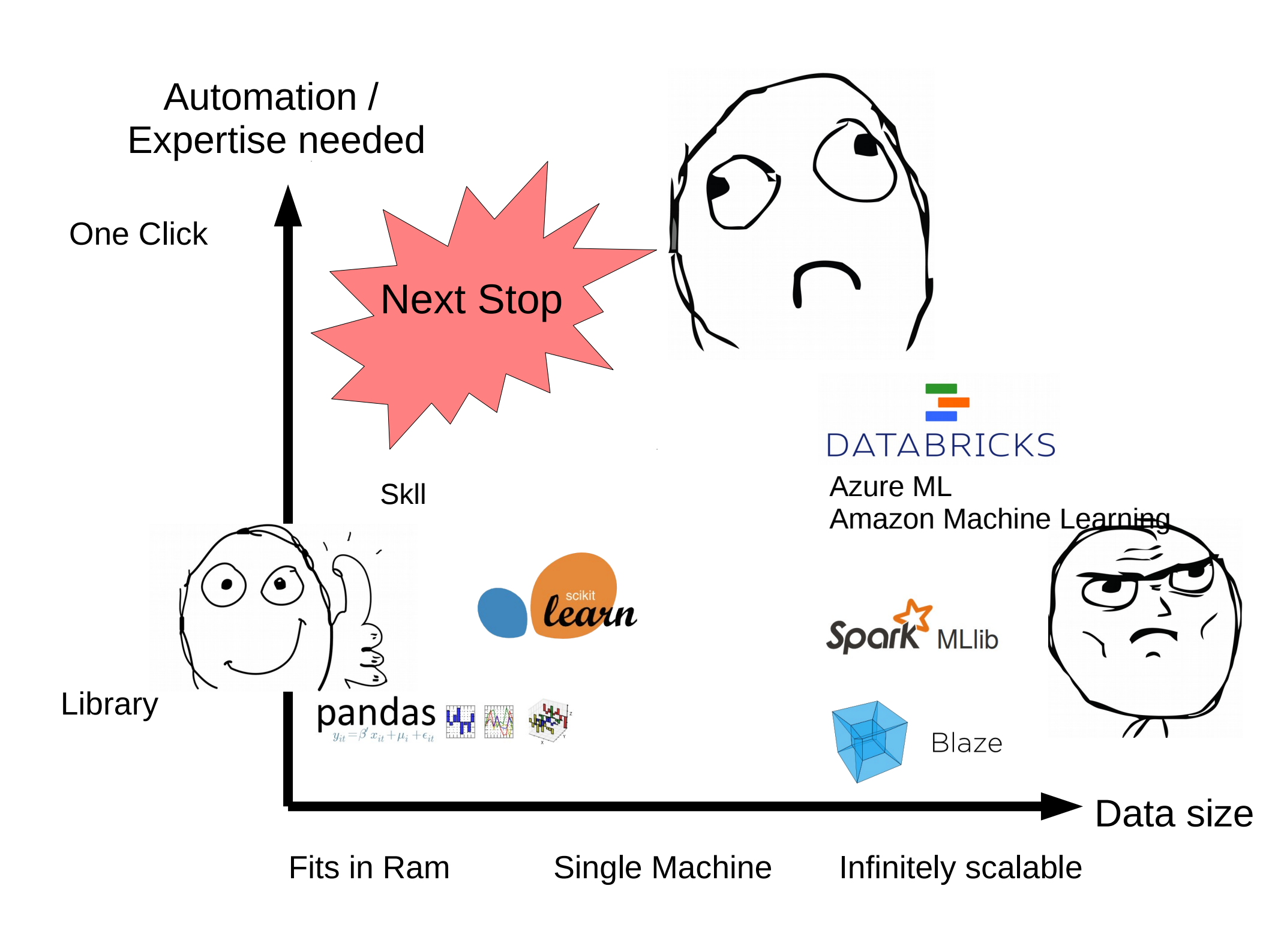
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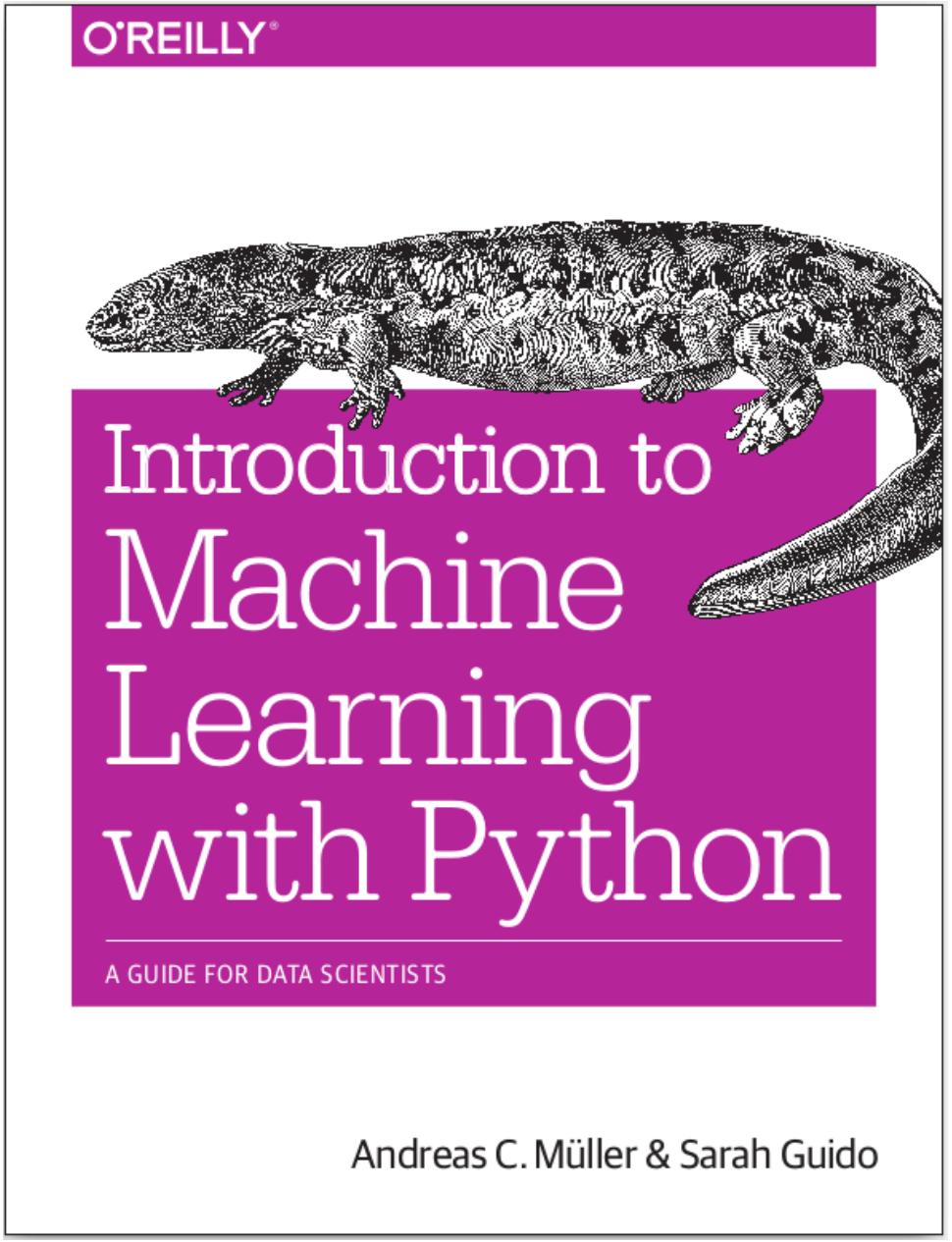

Release June 2016

Thank you.

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